FEMA-259-39076

FLOOD INSURANCE STUDY

COLUMBIANA COUNTY, OHIO
UNINCORPORATED AREAS

MARCH 5, 1990

Federal Emergency Management Agency

COMMUNITY NUMBER 390076

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

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FLOOD INSURANCE STUDY

COLUMBIANA COUNTY,
UNINCORPORATED AREAS,
OHIO

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the Unincorporated Areas of Columbiana County, Ohio, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood risk data for various areas of the community that will be used to establish actuarial flood insurance rates and assist the community in its efforts to promote sound floodplain management. Minimum floodplain management requirements for participation in the National Flood Insurance Program are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the State (or other jurisdictional agency) will be able to explain them.

1.2 Authority and Acknowledgments

The sources of authority for this Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for all streams in this study except North Fork Yellow Creek were performed by the Burgess & Niple, Ltd. (the Study Contractor) for the Federal Emergency Management Agency (FEMA), under Contract No. EMW-86-C-2251. This study was completed in December 1987.

The hydrologic and hydraulic analyses for North Fork Yellow Creek were obtained from the Preliminary Flood Insurance Study for the Village of Salineville prepared by the U.S. Geological Survey (USGS) (Reference 1).

1.3 Coordination

On January 30, 1986, a meeting was held with representatives of FEMA, Columbiana County, the Ohio Department of Natural Resources (ODNR), and the Study Contractor.

Upon initiation of the study, a news release was placed in the Morning Journal on November 22, 1986, to state the study objectives and to notify all interested persons to submit any relevant facts and technical data concerning local flood hazards.

Data pertinent to flood hazards were requested from the U.S. Army Corps of Engineers (COE), Pittsburgh District; the ODNR; FEMA; the USGS; the U.S. Soil Conservation Service; and Columbiana County. Conrail and the Ohio Department of Transportation were also contacted in order to obtain bridge data to be used in the hydraulic analyses.

An intermediate meeting attended by the Study Contractor and county officials was held in Columbiana County on November 18, 1987. The primary purpose of this meeting was to review the proposed floodplain and floodway boundaries.

On April 26, 1989, the results of this Flood Insurance Study were reviewed and accepted at a final coordination meeting attended by representatives of the Study Contractor, FEMA, and the community.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the unincorporated areas of Columbiana County, Ohio. The area of study is shown on the Vicinity Map (Figure 1). The incorporated areas within the county were excluded from this study.

Flooding caused by overflow of Longs Run, Middle Fork Little Beaver Creek, North Fork Yellow Creek, and the Ohio River was studied in detail.

Detailed flooding shown on Little Beaver Creek is due to flooding affects of the Ohio River.

Areas having low development potential or minimal flood hazards were previously studied using approximate analyses. The results were shown on the Flood Hazard Boundary Map for Columbiana County (Reference 2) and are incorporated into this Flood Insurance Study.

The streams studied by approximate methods included portions of Little Beaver Creek; North, West, and Middle Forks Little Beaver Creek; East Branch Middle Fork Little Beaver Creek; Sandy Creek; Sandy Creek Middle Branch; Conser Run; Brush Creek; Bull Creek; Little Bull Creek; Leslie Run; North Fork Yellow Creek; Little Yellow Creek; and the Mahoning River and its tributaries.

The areas studied were selected with priority given to all known flood hazard areas and areas of projected development or proposed construction through December 1992. The scope and methods of study were proposed to and agreed upon by FEMA and Columbiana County.

2.2 Community Description

Columbiana County lies on the eastern border of Ohio, occupies 514 square miles, and contains 18 townships (Reference 3). Columbiana County is bordered on the east by the Ohio River and Lawrence and Beaver Counties, Pennsylvania; on the south by Jefferson and Carroll Counties, Ohio and Hancock County, West Virginia; on the west by Stark County, Ohio; and on

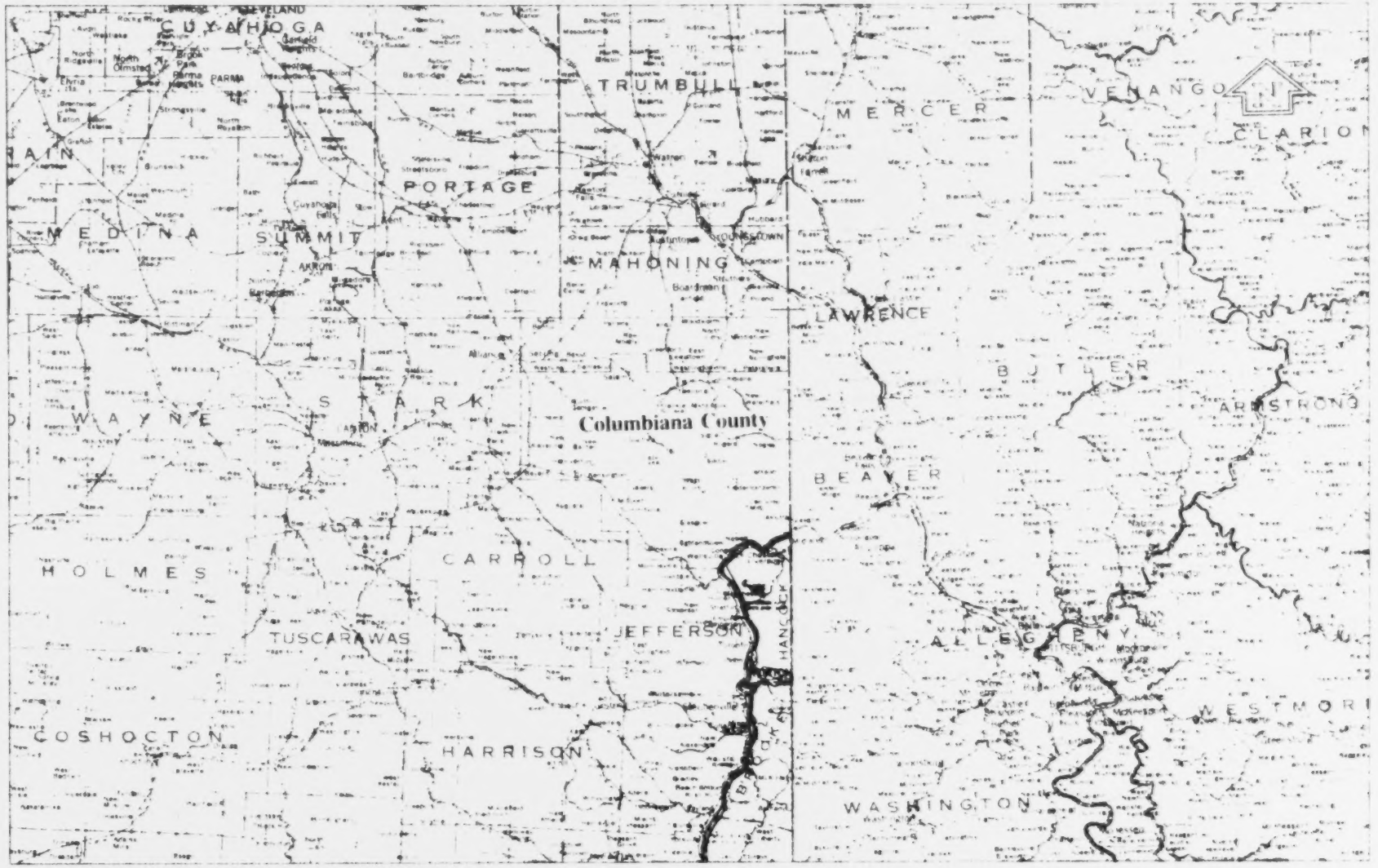

FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

COLUMBIANA COUNTY, OH

(UNINCORPORATED AREAS)

APPROXIMATE SCALE

16 0 16 32 48 MILES

VICINITY MAP

the north by Mahoning County, Ohio. The 1980 population of Columbiana County was reported to be 113,572 (Reference 4).

Longs Run, which flows northeasterly through the southeast portion of Columbiana County, flows into Little Beaver Creek. The stream is 8.9 miles long with an average gradient of 51.6 feet per mile (Reference 5) and has a drainage area of 14.8 square miles (Reference 6).

Middle Fork Little Beaver Creek flows south through the north-central portion and southeast through the central portion of Columbiana County. The creek is 36.2 miles long with an average gradient of 9.0 feet per mile (Reference 5) and has a drainage area of 149 square miles (Reference 6).

North Fork Yellow Creek originates at the Village of Salineville and flows southeast through the southwestern portion of Columbiana County. The creek is 17.9 miles long with an average gradient of 31.4 feet per mile (Reference 5) and has a drainage area of 59.5 square miles (Reference 6).

The climate of Columbiana County is classified as continental, and is marked by large annual and day-to-day ranges of temperature. Summers are moderately warm and humid with temperatures equal to or greater than 91 degrees Fahrenheit (^{o}F) in 9 of 10 years. Winters are cold and cloudy with temperatures equal to or less than -3^{o}F in 9 of 10 years. The mean annual precipitation for the county is 36.96 inches (Reference 7).

Columbiana County is located on the dissected Allegheny Plateau. The northern and central portions of the county are covered by glacial deposits and outwash, while the southern portion is unglaciated and characterized as hilly and rugged (Reference 8). The soils of Columbiana County have been classified into 10 soil associations, with the majority of the county in the Wooster-Canfield-Chili association. This association consists of gently sloping to very steep, well-drained to moderately well-drained soils (Reference 9).

The northern portion of Columbiana County was once covered by oak and sugar maple forests consisting mostly of sugar maple, red oak, white oak, black walnut, black maple, and hickory. The unglaciated southern portion was covered by a mixed oak forest consisting mostly of white oak, black oak, and hickory (Reference 10). Today, much of this forest has been cleared.

2.3 Principal Flood Problems

Records of past flooding on the streams within Columbiana County indicate that flooding may occur during any season of the year, however, most major floods have occurred between January and April.

2.4 Flood Protection Measures

Flood protection measures are not known to exist within the study area.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude that is expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10-, 2-, 1-, and 0.2-percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long-term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood that equals or exceeds the 100-year flood (1-percent chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for each riverine flooding source studied in detail affecting the community.

The 100-year flood frequency peak discharges for Longs Run and the two separate reaches of Middle Fork Little Beaver Creek were initially determined from the estimating equation presented in ODNR Bulletin No. 45 (Reference 11). Additional values for the 100-year flood frequency peak discharges were obtained from a COE log-log plot of estimated 100-year peak unit discharge rates versus drainage area. Discharge values derived from Bulletin No. 45 were all lower than the values obtained from the COE estimated 100-year peak unit-discharge rates versus drainage area curve. This difference results from the fact that the Bulletin No. 45 estimating equation was derived for a geographic area that is largely comprised of Lake Erie tributary watersheds north of the glaciation limit. The limit of glaciation passes through the Little Beaver Creek basin, which includes Longs Run. Discharge estimates for this geographic area are extremely sensitive to the basin storage parameter and the determination of this parameter is relatively subjective. Revised values calculated for these streams using the basin storage default value in the Bulletin No. 45 estimating equation gave a very consistent relationship and the resulting values represent a reasonable compromise between the COE curve and the initially determined ODNR discharges.

The magnitude of the discharges for the 100-year recurrence interval for North Fork Yellow Creek was determined by methods of regional analyses outlined by Webber and Bartlett (Reference 11). These methods consist of regression equations that utilize topographical and climatological

characteristics of the basin, based on regional analysis, to develop a flood-frequency cure.

The equations are power equations based on drainage area, and main-channel slope. There is not stream gage data available, and therefore, no adjustments were made to the North Fork Yellow Creek calculated discharges.

Peak discharge-drainage area relationships for the 100-year flood of each flooding source studied in detail in the community are shown in Table 1.

TABLE 1 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (SQ MILES)	PEAK DISCHARGE (CFS) 100-YEAR
LONGS RUN		
at Cannons Mills Road	10.5	2,520
at U.S. Route 30	8.5	2,240
at State Route 267	6.8	1,920
at Yeager Drive	4.8	1,610
MIDDLE FORK LITTLE BEAVER CREEK		
just upstream of West Fork Little Beaver Creek	149.0	13,100
just downstream of Turkeyfoot Run	147.2	13,000
just upstream of Turkeyfoot Run	142.7	12,700
about 1 mile downstream of State Route 45	88.4	8,960
at State Route 45	86.7	8,890
NORTH FORK YELLOW CREEK		
just upstream of Conrail	26.7	3,510
OHIO RIVER		
at New Cumberland Locks and Dam	23,870	411,000

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals.

Photogrammetry was employed to obtain floodplain cross sections and pertinent bridge/roadway profiles. The below-water portion of selected cross sections, as well as waterway openings of pertinent bridges, were field measured. In many cases, these waterway openings were taken from available bridge plans.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles and on the Flood Insurance Rate Map.

The simplified step-backwater method was used to establish the 100-year flood profile for all study reaches in Columbiana County except North Fork Yellow Creek. These water-surface elevations were computed using the HEC-2 step-backwater computer program (Reference 12). Starting water-surface elevations for these study reaches were determined using the slope area method. The starting water-surface elevation for North Fork Yellow Creek was determined by slope conveyance using data obtained from field surveys.

Channel and overbank roughness coefficients (Manning's "n") for the streams studied were chosen based upon field observation of the stream and floodplain areas. For Longs Run, the channel "n" value was 0.035, while the overbank "n" values ranged from 0.08 to 0.12. The channel "n" values for Middle Fork Little Beaver Creek ranged from 0.03 to 0.04 and the overbank "n" values ranged from 0.08 to 0.12. For North Fork Yellow Creek, the channel "n" values ranged from 0.03 to 0.10 and the overbank "n" values ranged from 0.08 to 0.12.

Flood profiles were drawn showing the computed water-surface elevations for floods of the selected recurrence intervals. The USGS step-backwater analysis program WSPRO (Reference 13) was used to determine the water-surface profile for North Fork Yellow Creek upstream of Haiti Road. The profile from Haiti Road to the downstream study limit was developed using engineering judgment.

The hydraulic analyses for this study are based on the effects of unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD). Elevation reference marks used in this study are shown on the map and described in the exhibit labeled Elevation Reference Marks.

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The National Flood Insurance Program encourages state and local governments to adopt sound floodplain management programs. Therefore, each Flood Insurance Study provides 100-year flood elevations and delineations of the 100- and 500-year floodplain boundaries and 100-year floodway to assist communities in developing floodplain management measures.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1-percent annual chance (100-year) flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2-percent annual chance (500-year) flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the 100- and 500-year floodplain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:24000 with a contour interval of 20 feet (Reference 14).

The 100-year floodplain boundaries are shown on the Flood Insurance Rate Map. On this map, the 100-year floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A, AE, AH, AO, A99, V, and VE). Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

For the streams studied by approximate methods, only the 100-year floodplain boundary was delineated using Flood Hazard Boundary Map for Columbiana County (Reference 2).

4.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces the flood-carrying capacity, increases the flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 100-year floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 100-year flood can be carried without substantial increases in flood heights. Minimum Federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced. The floodways in this study are presented to local agencies as minimum standards that can be adopted directly or that can be used as a basis for additional floodway studies.

The floodways for this study were computed for certain stream segments on the basis of equal conveyance reduction from each side of the floodplain. Floodway widths were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. The results of the floodway computations are tabulated for selected cross sections and are shown in Table 2, Floodway Data. The computed floodways are shown on the Flood Insurance Rate Map. In cases where the floodway and 100-year floodplain boundaries are either close together or collinear, only the floodway boundary is shown.

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NGVD)	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE (FEET)
OHIO RIVER								
A	46.33	1760[5]	65,246	6.4	685.3	685.3	686.0	0.7
NORTH FORK YELLOW CREEK								
A	10.47[2]	66[6]	508	8.5	865.7	865.7	866.6	0.9
MIDDLE FORK LITTLE BEAVER CREEK								
A	620[3]	182	1733	7.6	816.7	816.7	817.7	1.0
B	2950[3]	164	1804	7.3	841.7	841.7	841.7	0.0
C	5050[3]	130	1549	8.5	846.2	846.2	846.4	0.2
D	9080[3]	330	3998	3.3	850.0	850.0	851.0	1.0
E	12,110[3]	142	1014	12.5	856.7	856.7	856.7	0.0
F	3580[4]	135	2769	3.2	1014.5	1014.5	1015.5	1.0
G	8630[4]	565	9856	0.9	1014.9	1014.9	1015.9	1.0

[1]MILES BELOW HEADWATERS AT PITTSBURGH
[2]MILES ABOVE MOUTH
[3]FEET ABOVE MOUTH
[4]FEET ABOVE EAGLETON ROAD

[5]THIS WIDTH EXTENDS BEYOND STATE BOUNDARY
[6]THIS WIDTH EXTENDS WITHIN AREA NOT INCLUDED

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

COLUMBIANA COUNTY, OH
(UNINCORPORATED AREAS)

FLOODWAY DATA

OHIO RIVER—NORTH FORK YELLOW CREEK—MIDDLE FORK LITTLE BEAVER CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NGVD)	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE (FEET)
LONGS RUN								
A	3740	47	315	8.2	921.3	921.3	922.3	1.0
B	6010	53	350	7.4	938.6	938.6	938.6	0.0
C	10,580	57	478	4.9	961.3	961.3	961.3	0.0
D	12,720	100	359	5.3	976.8	976.8	976.8	0.0
E	16,010	65	306	6.3	986.2	986.2	986.7	0.5
F	19,970	80	328	4.9	998.8	998.8	999.8	1.0

[1]FEET ABOVE BELL SCHOOL ROAD

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

COLUMBIANA COUNTY, OH
(UNINCORPORATED AREAS)

FLOODWAY DATA

LONGS RUN

Along streams where floodways have not been computed, the community must ensure that the cumulative effect of development in the floodplain will not cause more than 1.0-foot increase in the base flood elevations at any point within the community.

The area between the floodway and the 100-year floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood by more than 1.0 foot. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 2.

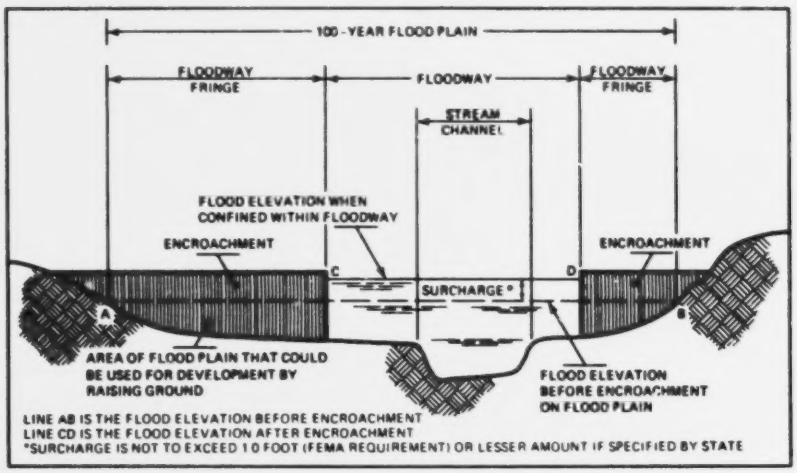
100-YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
SURCHARGE *
A
B
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE AB IS THE FLOOD ELEVATION BEFORE ENCROACHMENT
LINE CD IS THE FLOOD ELEVATION AFTER ENCROACHMENT
*SURCHARGE IS NOT TO EXCEED 1.0 FOOT (FEMA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE

FIGURE 2 - Floodway Schematic

5.0 INSURANCE APPLICATION

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. These zones are as follows:

Zone A

Zone A is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base flood elevations or depths are shown within this zone.

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by detailed methods. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 100-year floodplain, areas of 100-year flooding where average depths are less than 1 foot, areas of 100-year flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 100-year flood by levees. No base flood elevations or depths are shown within this zone.

6.0 FLOOD INSURANCE RATE MAP

The Flood Insurance Rate Map is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 100-year floodplains that were studied by detailed methods, shows selected whole-foot base flood elevations or average depths. Insurance agents use the zones and base flood elevations in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols the 100- and 500-year floodplains, the floodways, and the locations of selected cross sections used in the hydraulic analyses and floodway computations.

7.0 OTHER STUDIES

Flood Insurance Studies published for Mahoning and Stark Counties, Ohio; Hancock County, West Virginia; the City of East Liverpool, Ohio; the Village of Minerva, Ohio (References 15-19) are in agreement with this study.

Flood Insurance Rate Maps printed for the Villages of Leetonia, Hanoverton, and New Waterford; the Cities of Salem, East Palestine and Wellsville, Ohio; the Borough of Ohioville, Pennsylvania; and the Townships of Darlington and South Beaver, Pennsylvania (References 20-28) are in agreement with this study.

The Flood Insurance Rate Map printed for the Township of Little Beaver, Pennsylvania (Reference 29) is not in agreement with this study due to approximate flood hazards available in this study.

The Flood Insurance Study in progress for the Village of Salineville (Reference 1) is in agreement with this study.

This Flood Insurance Study supersedes the previously printed Flood Hazard Boundary Map for Columbiana County (Reference 2).

8.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting the Natural and Technological Hazards Division, FEMA, 175 West Jackson Boulevard, 4th Floor, Chicago, Illinois 60604.

9.0 REFERENCES AND BIBLIOGRAPHY

1. Federal Emergency Management Agency, Flood Insurance Study, Village of Salineville, Columbiana County, Ohio, in progress.

2. ————, Flood Hazard Boundary Map, Columbiana County, Unincorporated Areas, Ohio, September 1984.

3. The National Survey, Columbiana County, Ohio, Highway Map, Chester, Vermont, 1987.

4. U.S. Department of Commerce, Bureau of the Census, 1980 Census of Population, Number of Inhabitants, Ohio, Washington, D.C., February 1982.

5. Ohio Department of Natural Resources, Division of Water, Report No. 12, Gazetteer of Ohio Streams, 1960.

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10. The Ohio State University, Ohio Biological Survey, The Natural Vegetation of Ohio in Pioneer Days, Robert B. Gordon, 1966.

11. Ohio Department of Natural Resources, Division of Water, Bulletin No. 45, Floods in Ohio, Magnitude and Frequency, E.E. Webber and W.P. Bartlett, Jr., May 1977.

12. U.S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-2 Water Surface Profiles, Computer Program 723-X6-L202A, Davis, California, April 1984.

13. U.S. Department of Transportation, Federal Highway Administration, Report No. FHWA/RD-86/108, Bridge Waterways Analysis Model: Research Report, J.O. Shearman, W.H. Kirby, V.R. Snyder, and H.N. Flippo, July 1986.

14. U.S. Geological Survey, 7.5 Minute Series Topographic Maps, Scale 1:24000, Contour Interval 20 Feet: East Liverpool North, Ohio-Pennsylvania-West Virginia, 1984; East Liverpool South, Ohio-Pennsylvania-West Virginia, 1978; Gavers, Ohio, 1971; Lisbon, Ohio, 1984; Salineville, Ohio, 1971; Wellsville, Ohio-West Virginia, 1978; West Point, Ohio, 1985.

15. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Insurance Study, Mahoning County, Unincorporated Areas, Ohio, February 1979.

16. Federal Emergency Management Agency, Flood Insurance Study, Stark County, Unincorporated Areas, Ohio, September 1983.

17. ————, Flood Insurance Study, Hancock County, Unincorporated Areas, West Virginia, December 1983.

18. ————, Flood Insurance Study, City of East Liverpool, Columbiana County, Ohio, July 1983.

19. ————, Flood Insurance Study, Village of Minerva, Ohio, Carroll, Stark, and Columbiana Counties, Ohio, July 1982.

20. ————, Flood Insurance Rate Map, Village of Leetonia, Columbiana County, Ohio, August 1987.

21. ————, Flood Insurance Rate Map, Village of Hanoverton, Columbiana County, Ohio, September 1987.

22. ————, Flood Insurance Rate Map, Village of New Waterford, Columbiana County, Ohio, May 1987.

23. ————, Flood Insurance Rate Map, City of Salem, Columbiana County, Ohio, September 1985.

24. ————, Flood Insurance Rate Map, City of East Palestine, Columbiana County, Ohio, September 1987.

25. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Insurance Rate Map, City of Wellsville, Columbiana County, Ohio, September 1978.

26. Federal Emergency Management Agency, Flood Insurance Rate Map, Borough of Ohioville, Beaver County, Pennsylvania, September 1984.

27. ————, Flood Insurance Rate Map, Township of Darlington, Beaver County, Pennsylvania, September 1986.

28. ————, Flood Insurance Rate Map, Township of South Beaver, Beaver County, Pennsylvania, September 1986.

29. ————, Flood Insurance Rate Map, Township of Little Beaver, Lawrence County, Pennsylvania, May 1986.

ELEVATION REFERENCE MARKS

REFERENCE MARK	FLOOD INSURANCE RATE MAP PANEL	ELEVATION (FEET NGVD)	DESCRIPTION OF LOCATION
1	0040	1,025.20	chiseled square on large sandstone boulder located along west side of Teegarden Road about 0.54 mile southwest of the intersection of Teegarden Road and State Route 45
2	0040	990.82	standard tablet stamped "991 1906" set in bridge seat at southwest corner of Eagleton Road bridge over Middle Fork Little Beaver Creek
3	0175	815.37	standard tablet stamped "7 WSM 1959 815" set on northeast wingwall of Clarks Mill Road bridge over North Fork Yellow Creek
4	0140	861.25	standard tablet stamped "135LLB 1957 861" set in center of concrete stone monument located in Ohio State roadside park west of State Route 7, about 700 feet north of the intersection of State Route 7, Middle Beaver Road, and Bear Hollow Road
5	0140	864.67	standard tablet stamped "136 LLB 1957 864" set on south concrete abutment of State Route 7 bridge over West Fork Little Beaver Creek
6	0180	1,127.14	standard tablet stamped "157LLB 1957 1128" set in concrete base of sign located along east side of Cannons Mills Road about 90 feet north of intersection of Cannons Mills Road and State Route 267

700
690
680
670
660
650
640
630
620
ELEVATION IN FEET (NGVD)
LIMIT OF FLOODING AFFECTING COMMUNITY
STATE BOUNDARY
CONFLUENCE OF LITTLE BEAVER CREEK
LIMIT OF FLOODING AFFECTING COMMUNITY
A
47
46
45
44
43
42
41
40
39
STREAM DISTANCE IN MILES BELOW HEADWATERS AT PITTSBURGH
LEGEND
500-YEAR FLOOD
100-YEAR FLOOD
50-YEAR FLOOD
10-YEAR FLOOD
STREAM BED
CROSS SECTION LOCATION
FLOOD PROFILES
OHIO RIVER
COLUMBIANA COUNTY, OH
(UNINCORPORATED AREAS)
01P

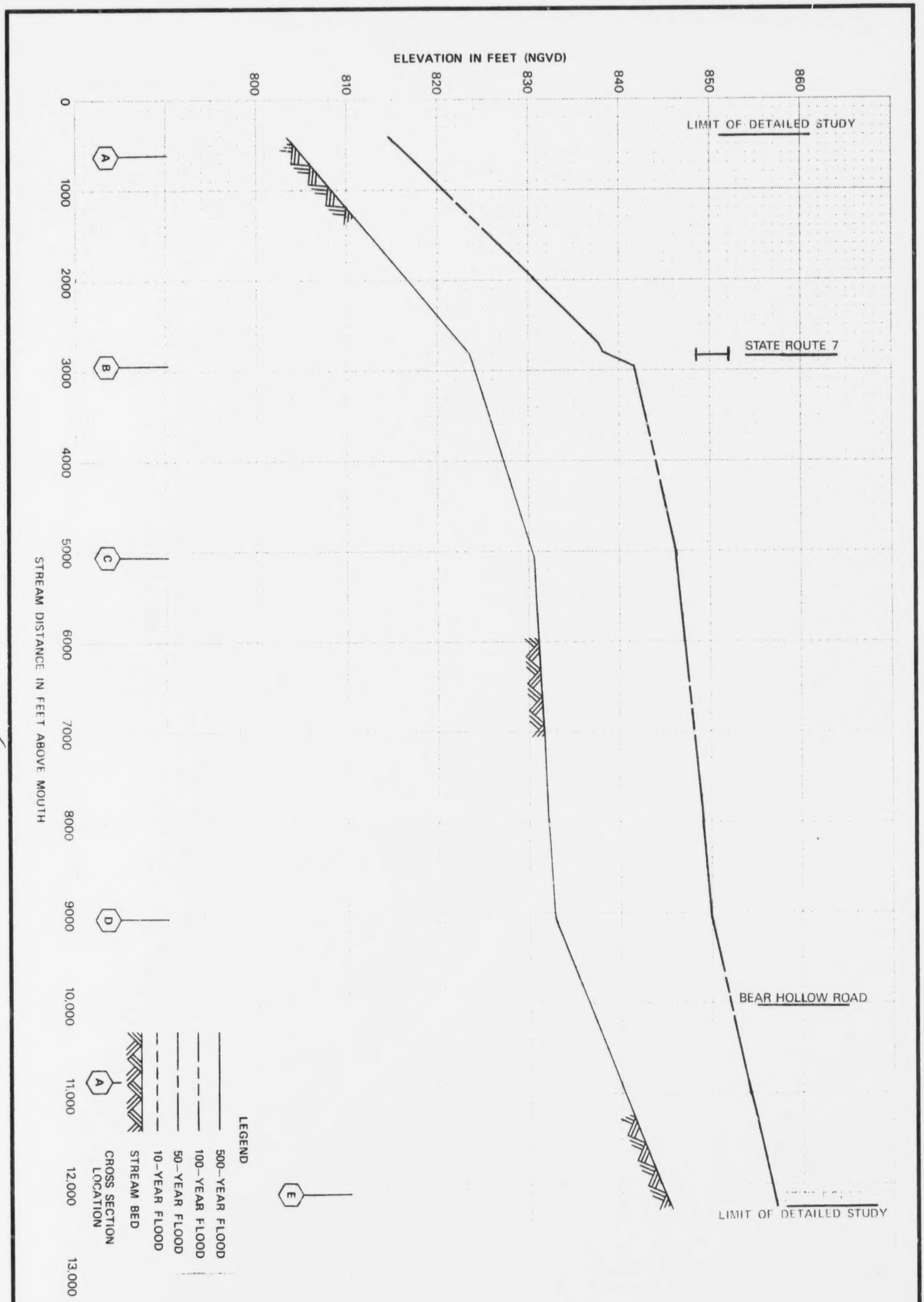
FLOOD PROFILES

NORTH FORK YELLOW CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

COLUMBIANA COUNTY, OH
(UNINCORPORATED AREAS)

02P



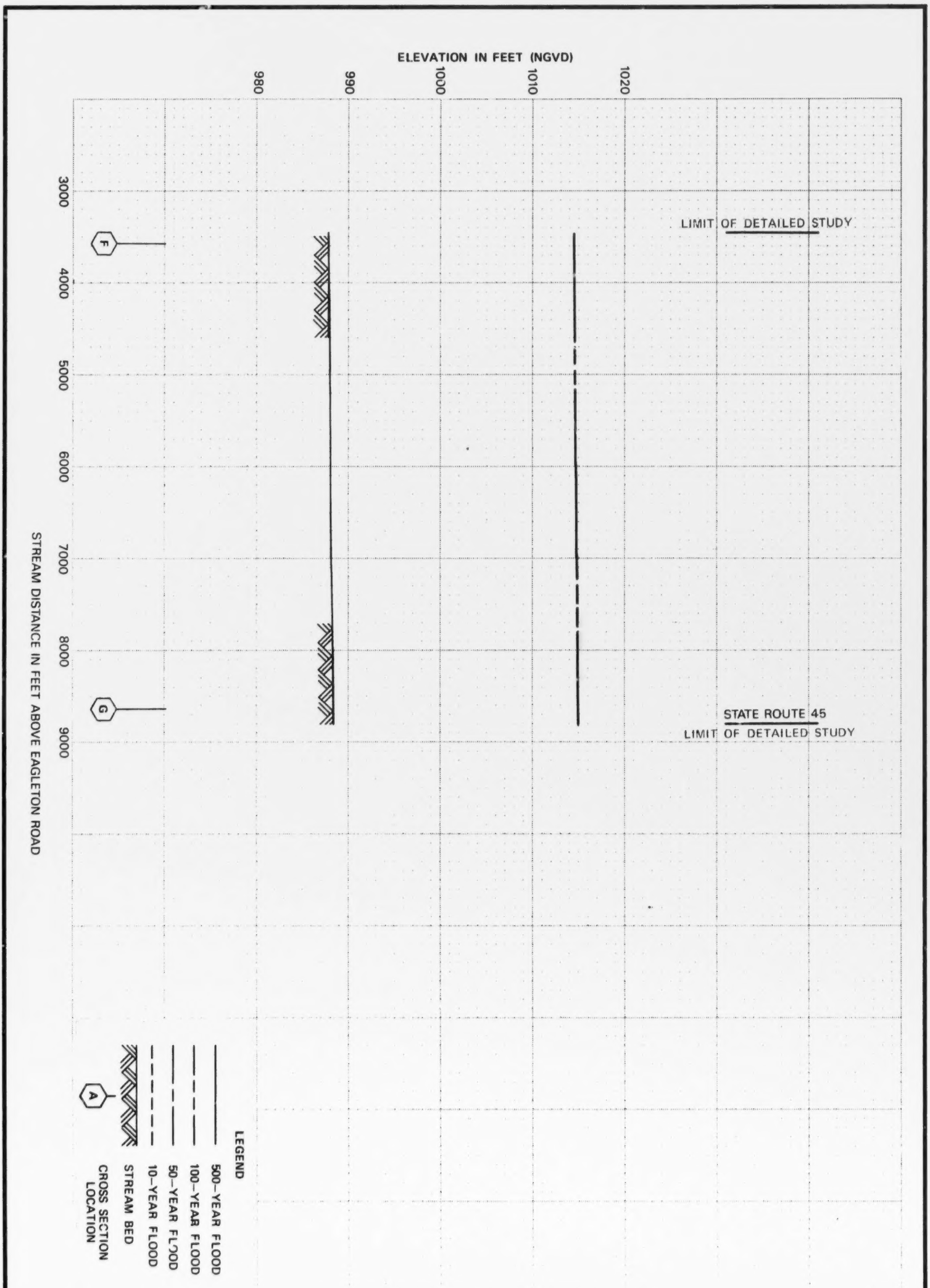
03P

FEDERAL EMERGENCY MANAGEMENT AGENCY

COLUMBIANA COUNTY, OH
(UNINCORPORATED AREAS)

FLOOD PROFILES

MIDDLE FORK LITTLE BEAVER CREEK



19

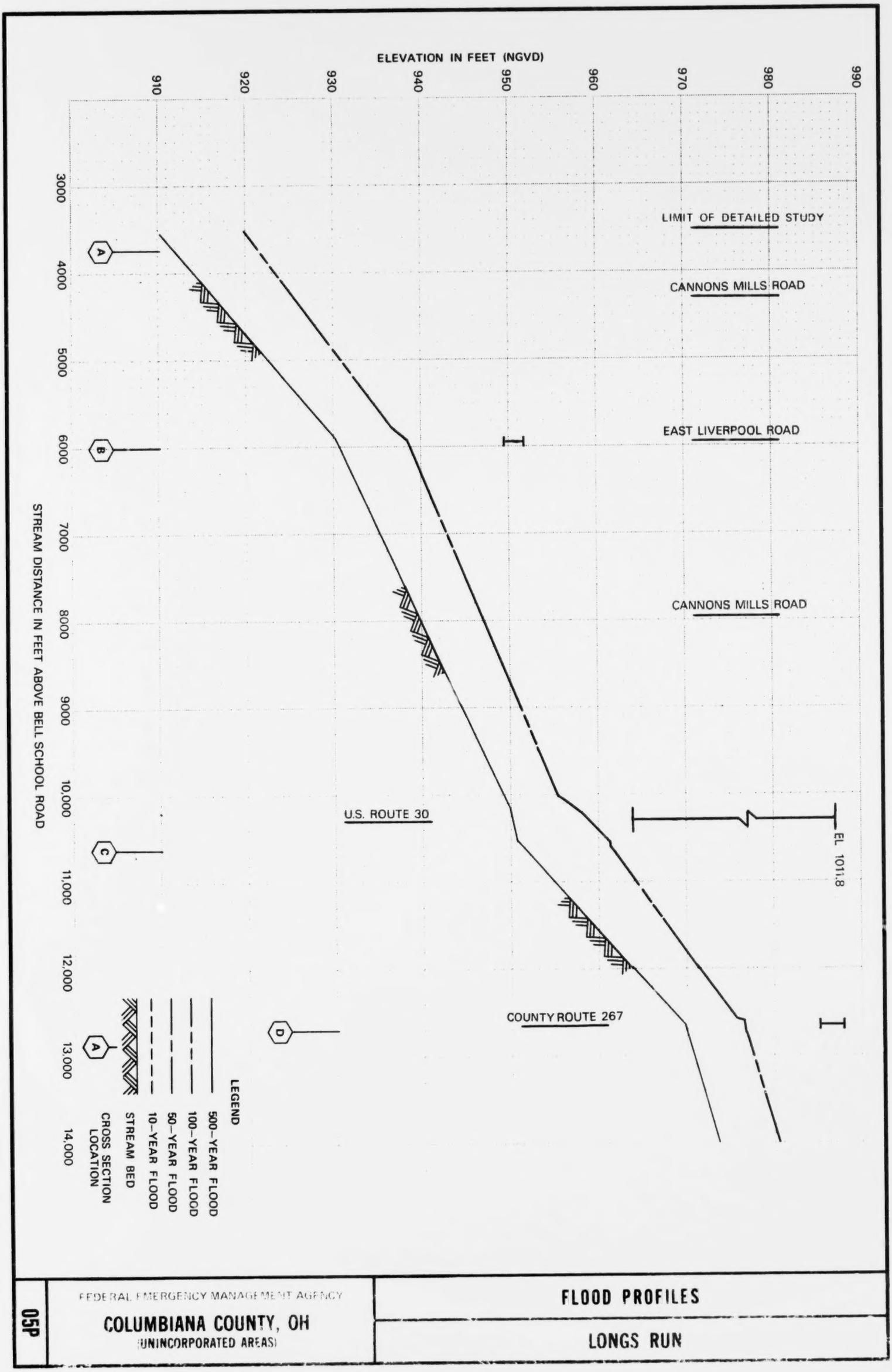
04P

FEDERAL EMERGENCY MANAGEMENT AGENCY

COLUMBIANA COUNTY, OH
(UNINCORPORATED AREAS)

FLOOD PROFILES

MIDDLE FORK LITTLE BEAVER CREEK



05P	FEDERAL EMERGENCY MANAGEMENT AGENCY COLUMBIANA COUNTY, OH (UNINCORPORATED AREAS)	FLOOD PROFILES LONGS RUN

FLOOD PROFILES

LONGS RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY

COLUMBIANA COUNTY, OH

(UNINCORPORATED AREAS)

06P